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American Woods

July 1945

Eastern Hemlock

Forest Service

U. S. DEPARTMENT OF AGRICULTURE

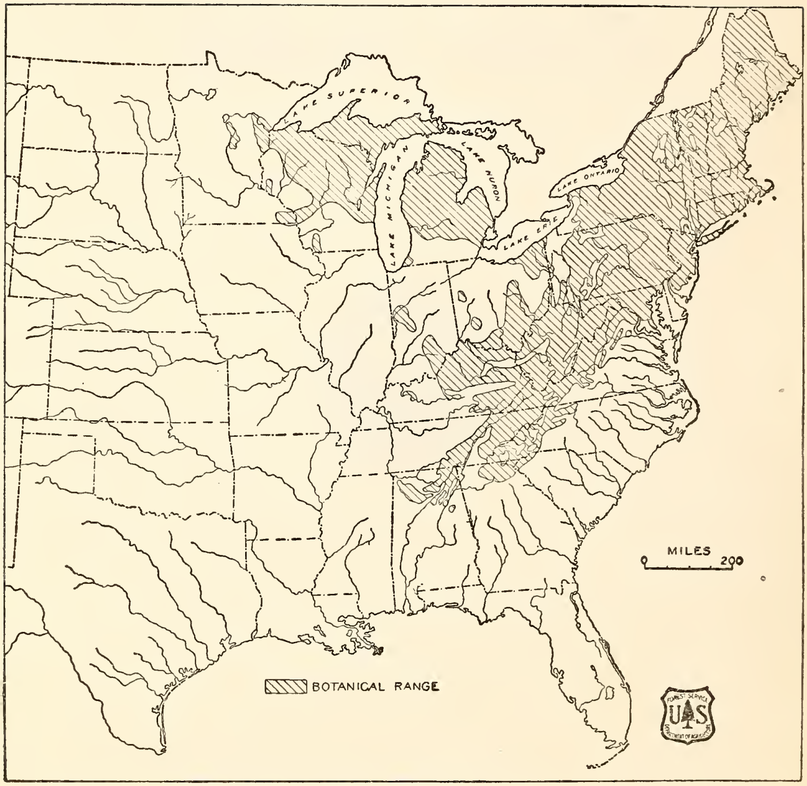

FIGURE 1.—Range of eastern helmlock (*Tsuga canadensis*).

EASTERN HEMLOCK

(*Tsuga canadensis*)

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Eastern hemlock grows in the northeastern part of the United States and in the southeastern part of Canada. It is a tree of medium size, usually reaching a height of 60 to 80 feet and a diameter of 2 to 3 feet. Eastern hemlock has long been cut for lumber, but the cut was small until the bulk of the Eastern white pine was gone. The lumber is used principally for building construction and boxes and crates. In addition to lumber, Eastern hemlock supplies large quantities of pulpwood, which is used principally in making news and wrapping paper.[1] The bark has been one of the principal sources of tannin—a material used in converting hides and skins into leather. Although the stand of Eastern hemlock has been greatly reduced by heavy cutting, considerable quantities remain and the wood will continue to be an important factor in lumber, pulp, and tannin production for years to come. The tree, however, does not produce as satisfactory lumber as its associates, Eastern white pine and red pine, nor is the wood as desirable as spruce for paper pulp, and the pines and spruces will undoubtedly be favored in forest-management plans.

Nomenclature.—Eastern hemlock is generally known simply as "hemlock." The names hemlock spruce and spruce pine are also used to some extent, particularly in the southern portions of the regions where Eastern hemlock grows.

Distribution and growth.—In the United States Eastern hemlock is found in the Lake States, the New England States, New York, Pennsylvania, and southward in the Appalachian Mountains to northern Alabama and northern Georgia (fig. 1).

Eastern hemlock bears seed abundantly every 2 or 3 years but does not reproduce well. The seeds germinate readily, but the seedlings die unless they have the proper amount of moisture and shade. Too much or too little of either will kill them. The young trees are relatively free from serious fungus diseases, but as they grow older and reach saw-timber size become subject to a fungus which causes butt-rot and are also attacked by a bark borer which has caused the death of a considerable quantity of timber in the Appalachians and in the Lake States. Eastern hemlock trees can endure considerable shade and frequently form the understory in mixed forests.

The tree reaches its largest size in the southern Appalachians, where there is a long growing season and a mild and humid climate. Under

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[1] Eastern hemlock pulpwood often includes logs quite suitable in size and quality for the manufacture of lumber.

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such conditions trees 50 years old average about 3.4 inches in diameter and 30 feet in height; trees 100 years old about 10.5 inches in diameter and 58 feet in height; and trees 200 years old about 20.7 inches in diameter and 87 feet in height. Exceptional trees may reach a height of 100 feet and a diameter of 4 feet at an age of 400 years or more. In the Lake States, where conditions are not quite so favorable to Eastern hemlock, the diameter and height growth is somewhat slower. Eastern hemlock which has been growing slowly in dense shade recuperates readily when the overtopping trees are cut out and grows at a considerably faster rate.

Supply.—The stand of Eastern hemlock in the United States of saw-timber size was estimated in 1938 at 17,552,000,000 board feet.[2] Of this, 9,222,000,000 board feet was placed in the Lake States, 6,137,000,000 board feet in the Northeastern States, and 2,180,000,000 board feet in the southern Appalachian Mountains. The Lake States estimate is based on a forest survey completed in 1938.[3] It is made up of a stand of 2,672,000,000 board feet in Wisconsin and 6,550,000,000 board feet in Michigan. Forest survey findings for the stand of Eastern hemlock in other parts of its range are not yet available.

PRODUCTION

Lumber.—Eastern hemlock has been cut for lumber since early colonial days. The amount produced, however, was small until the bulk of the Eastern white pine was gone. The earliest available statistics show a production of 770,000,000 board feet of Eastern hemlock in 1869.[4] Production increased steadily for the next 30 years (fig. 2) and in 1906 reached a maximum of 3,431,000,000 board feet—about 9 percent of the total lumber cut in that year. After 1906 the production of Eastern hemlock lumber declined and in 1932, a year of business depression, was only 138,000,000 board feet. By 1941 it had recovered to 565,000,000 board feet, which was less than 2 percent of the total lumber production in that year, but was the largest cut of Eastern hemlock since 1929. In 1942, however, the cut dropped to 542,000,000 board feet in spite of war demands for lumber and in 1943 production was 496,723,000 board feet. For the 10-year period 1933–1942 the average annual production of eastern hemlock was 376,000,000 board feet. Pennsylvania was the leading State in production from 1869 to 1908. Since then Wisconsin has held first place and Michigan second place.[5] In 1942 these two States produced nearly one-half of the Eastern hemlock lumber. The 1942 cut came from 21 States.

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[2] UNITED STATES CONGRESS, JOINT COMMITTEE ON FORESTRY. FOREST LANDS OF THE UNITED STATES. 77th Cong., 1st sess., S. Doc. 32, 44 pp. 1941.

[3] Conducted by the Lakes States Forest Experiment Station as part of a Forest Survey of the United States.

[4] The production of Eastern white pine lumber in the same year amounted to 5,806,000,000 board feet.

[5] Except in 1908, 1909, and 1932, when Pennsylvania was second.

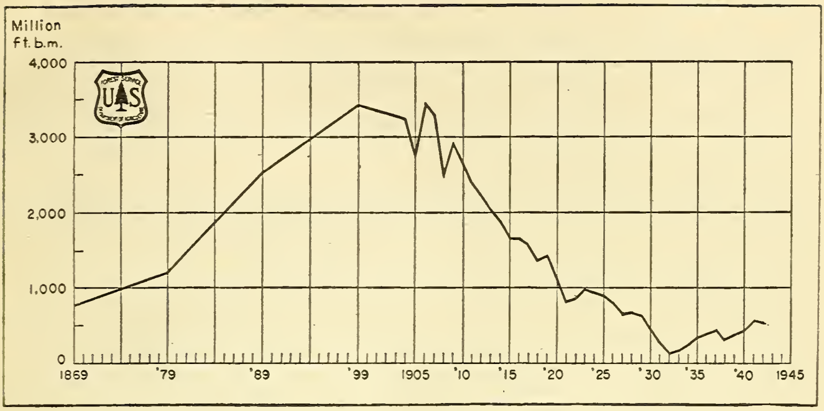

FIGURE 2.—Lumber production of Eastern hemlock, 1869–1942.

Pulpwood.—The earliest available statistics for hemlock pulpwood are for the year 1905. They show a consumption of 375,000 cords of Eastern hemlock pulpwood in the manufacture of paper pulp. This was approximately 12 percent of the total pulpwood used, including all species. The use of Eastern hemlock as a pulwood increased fairly steadily after 1905 and in 1927 reached a maximum of 818,000 cords—still about 12 percent of the total. In 1931 consumption dropped to 476,000 cords (about 7 percent of total) and in 1940 to about 396,000 cords[6] (between 2 and 3 percent of total). In each of the years 1941 and 1942 consumption is estimated at approximately 500,000 cords, and in 1944 at approximately 600,000 cords. The average annual consumption of Eastern hemlock pulpwood in recent years has been roughly 420,000 cords, equivalent to about 125,000,000 board feet. Wisconsin has been the leading State in furnishing Eastern hemlock pulpwood since 1920. Michigan occupied second place from 1920 to 1928 and Maine ranked second from 1928 to 1932.[7]

Tannin.—The consumption of tannin[8] from Eastern hemlock bark by tanneries in the United States in 1923 amounted to 16,456 tons and was 10.8 percent of the total amount of tannin used.[9] In 1931 Eastern hemlock supplied 7,076 tons of tannin which was 8.9 percent of the total used[10] and in 1939, 741 tons, which was less than 2 percent of the total production in that year. The extensive use of leather for military purposes in recent years has resulted in greatly increased demands for tannin. In 1942 production from Eastern hemlock rose to 1,800 tons.[11] The bark which supplied this tannin came largely from pulpwood which must be peeled before it can be used for paper pulp.[12] The harvesting of Eastern hemlock bark for tannin production is generally carried on in connection with pulpwood or lumbering operations, although in the past trees were often felled for the bark alone and the peeled logs left in the forest.

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[6] The consumption of Western hemlock pulpwood in 1940 was 2,240,000 cords.

[7] Later figures on the pulpwood consumption of Eastern hemlock by States are not available.

[8] Tannins occur in the bark, wood, leaves, roots, and fruits of plants. They are used in large quantities, both in their natural form and as prepared extracts, as one of the essential materials in the leather industry. Their function is to render leather resistant to putrefaction and to make it more or less soft and pliable. The consumption figures given represent the net weight of the available tannin from the raw material and not the bulk weight of the raw material from which the tannin is obtained.

[9] In 1923 the total amount of tannin used in the United States was 152,732 tons. About 91,000 tons was supplied from domestic sources (principally chestnut wood, chestnut oak bark, and Eastern hemlock bark) and about 62,000 tons was from imported materials (principally quebracho).

[10] In 1931 the total amount of tannin used in the United States was 79,850 tons. About one-half was from domestic materials and one-half from imported materials.

The total annual cut of Eastern hemlock in recent years for all purposes, including mainly lumber and pulpwood and also indeterminate amounts used for other purposes, principally fuel and crossties, is estimated in round numbers at 550,000,000 board feet.

Properties.—The heartwood of Eastern hemlock is pale brown with a reddish hue. The sapwood is usually not distinct from the heartwood. Occasionally it is lighter in color. The annual rings are distinct, with the soft, reddish springwood merging gradually into the narrower, harder, and darker summerwood. The wood is coarse and uneven in texture, inclined to splinter under tools, and quite subject to ring shake.[13] It is free from resin and odorless when seasoned but often has a sour odor before it has been dried. Eastern hemlock requires care in seasoning and is not rated high in ability to stay in place. The wood is moderately light in weight,[14] moderately hard, moderately weak, moderately limber, and moderately low in shock-resisting ability. In nail-holding power it ranks with ponderosa pine—slightly above Eastern spruce but considerably below Western hemlock and Douglas-fir. In splitting resistance Eastern hemlock has a low rank, being below white fir and Eastern spruce. The wood lacks durability when subjected to conditions favorable to decay. In this respect it is classed with beech, birch, maple, the spruces, and red oak. In paint-holding ability it is superior to the southern pines and Douglas-fir but inferior to the cedars and white pines.

The wood of Eastern hemlock can be reduced to paper pulp [15] by the sulfite and sulfate processes to yield pulps somewhat darker and usually weaker than spruce pulps, which have long been considered standard. In the manufacture of mechanical pulp from Eastern hemlock considerably more power is required than for spruce, and the reddish pulp is somewhat brittle.

The bark of Eastern hemlock contains 10 to 13 percent tannin.

Principal uses.—Eastern hemlock is used principally for lumber and paper pulp. The bark has been an important source of tannin since the early days of the leather industry. Eastern hemlock lumber is used largely in building construction for framing, sheathing, subflooring, and roof boards, and in the manufacture of boxes and crates. Smaller amounts go into car construction and repair, general millwork, and signs.

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[11] In 1942 the total amount of tannin used in the United States was approximately 148,000 tons. Of this amount about 56,000 tons was from domestic materials (principally chestnut wood) and about 92,000 tons was imported materials (principally quebracho).

[12] Only a portion of the peeled bark available from Eastern hemlock pulpwood operations is utilized. The unused bark represents a potential source of more tannin. The recovery of this tannin is dependent on the development of practical and paying methods of handling the bark.

[13] Ring shake, or cup shake, is a separation between the annual rings ascribed to the bending action of the wind on the standing tree.

[14] The average weight of Eastern hemlock in a thoroughly air-dry condition (12 percent moisture) is 28 pounds per cubic foot.

[15] Six processes are used commercially in making paper pulp from wood. One is the mechanical or ground-wood process, in which the wood is reduced to pulp on a grindstone. The yield approaches 100 percent of the weight of the wood. Four are chemical processes—the sulfite, sulfate, soda, and neutral sulfite. They depend upon the dissolving action of chemical reagents which remove essentially all of the binding material (lignin) surrounding the cellulose fibers and leave them in a fairly pure state. The removal of the lignin is accomplished by cooking the wood chips with the proper chemical under steam pressure. The yield of pulp is about one-half the weight of the wood. In a sixth process, the semichemical, part of the lignin is removed by chemical means, and the resultant pulp, containing some lignin, is further refined by mechanical means. The yield of semichemical pulp is intermediate between the yields obtained with the mechanical process and the chemical processes.

As a pulpwood, Eastern hemlock is used principally in the maanufacture of news and wrapping papers and to a less extent in the manufacture of book and printing papers. The wood is generally pulped by the sulfite process.

Hemlock oil (hemlock needle oil) is distilled from the needles and twigs. It is used in medicine.

Table 1 shows the amounts of Eastern hemlock used in the manufacture of wooden products in 1933 and 1940. The tabulation includes Eastern hemlock in the form of lumber, with a very small proportion of logs and bolts, and veneer.

TABLE 1.—*Eastern hemlock used in the manufacture of wooden products*[1]
[Thousands of board feet]

Classes of products	1933	1940
Airplanes	--------	--------
Agricultural implements	9	13
Boot and shoe findings	--------	--------
Boxes, baskets, and crating	59,790	67,743
Boxes, cigar and tobacco	--------	--------
Butchers' blocks	--------	--------
Car construction and repair	8,084	8,740
Caskets and burial boxes	--------	--------
Conduits, pumps, and wood pipe	--------	30
Dairy, poultry, and apiary supplies	200	--------
Dowels and skewers	--------	--------
Electrical equipment	--------	416
Firearms	--------	--------
Fixtures	26	130
Flooring	--------	--------
Furniture	19	559
Handles	--------	--------
Instruments, musical	--------	--------
Instruments, professional and scientific	--------	--------
Ladders	122	--------
Laundry appliances	--------	--------
Machinery	30	95
Matches	--------	--------
Patterns and flasks	200	614
Pencils, penholders	--------	--------
Pipes, tobacco	--------	--------
Playground equipment	--------	--------
Plumbers' woodwork	--------	50
Printing material	--------	--------
Radio and phonograph cabinets	16	--------
Refrigerators	128	231
Rollers, shade and map	--------	--------
Sash, doors, general millwork	980	2,410
Sewing machines	--------	--------
Ship and boat building	2	16
Shuttles, spools, bobbins, looms	--------	--------
Signs, scenery, displays	125	751
Sporting and athletic goods	--------	96
Surgical supplies	--------	--------
Tanks	5	4
Toothpicks	--------	--------
Toys	60	125
Trunks and valises	--------	--------
Vehicles, motor	10	100
Vehicles, nonmotor	--------	--------
Venetian blinds	--------	--------
Woodenwear and novelties	1	--------
Total	69,807	82,323

[1] The two hemlocks, Eastern and Western, are not separated in previous canvasses of wood used in manufacture (1912 and 1928) but are grouped together as hemlock. The total amount of hemlock used in the manufacture of wooden products in 1912 and 1928, including planing mill products which were omitted in the 1933 and 1940 canvasses, was as follows: 1912, 708,753,000 board feet; 1928, 595,124,000 board feet.

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U. S. GOVERNMENT PRINTING OFFICE: 1945

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